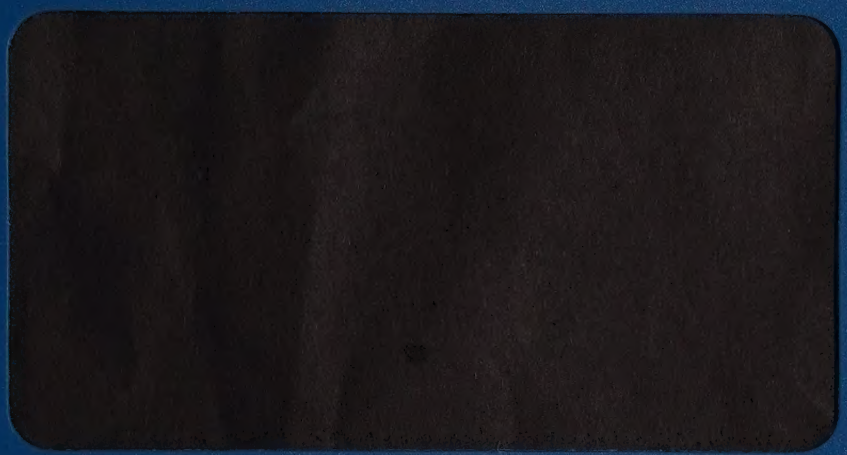

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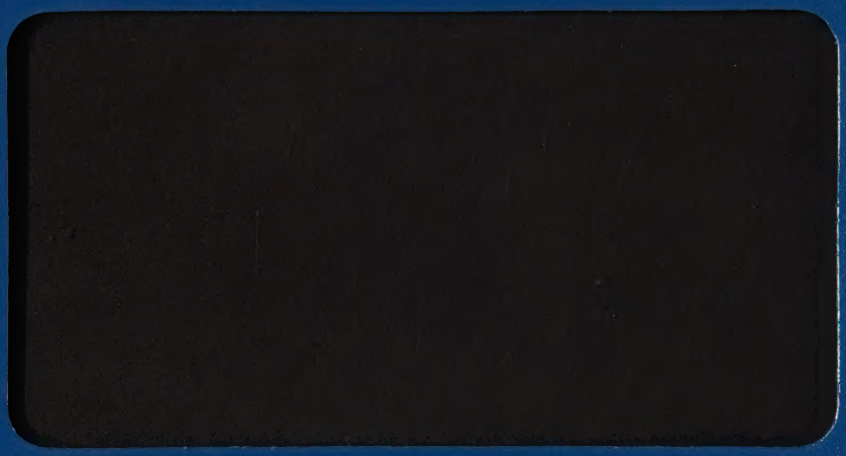

TECHNICAL MANUAL

OPERATION AND MAINTENANCE INSTRUCTIONS

MODEL GPD352A
RASTER DISPLAY
(Part Number 40300501)

and

MODEL GPD353A
WATERFALL DISPLAY ADAPTER KIT
(Part Number 40344501)

SCIENTIFIC-ATLANTA
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SAFETY SUMMARY

GPD352A RASTER DISPLAY
AND
GPD353A WATERFALL ADAPTER KIT

1. GENERAL

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this technical manual. It is the user's responsibility to understand and apply these safety precautions during all phases of operation, service, and repair of this system. Failure to comply with these precautions or with specific warnings elsewhere in this technical manual violates safety standards of design, manufacture, and intended use of this system.

2. GROUND THE SYSTEM

To minimize shock hazard, the system chassis and equipment cabinet must be connected to an electrical ground. The GPD352A is equipped with a three-conductor AC power cable. This power cable must be installed in accordance with installation procedures provided.

3. SET INPUT POWER SWITCHES

The GPD352A has two input power select switches (S1 and S2) located on its back panel. These are both to be set at either 115V or 230V, depending on the input voltage being applied to the instrument.

GPD352A/353A APPLICATION NOTE

The GPD352A/353A are enhanced versions of the GPD352/353.

The GPD352A/353A interface directly with the latest version of the GPD350-6A (serial numbers 521 and higher).

If your GPD352A/353A is installed as an upgrade to an existing GPD352/353, or is to be used with a GPD350-6A which has a serial number less than 520, refer to document 400089, "GPD350-6A Update Verification for GPD352A/353A Compatability."

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ASSOCIATED DOCUMENTS

A. Schematic Set - Document No.
B. U.S. Pixel Monitor Manual

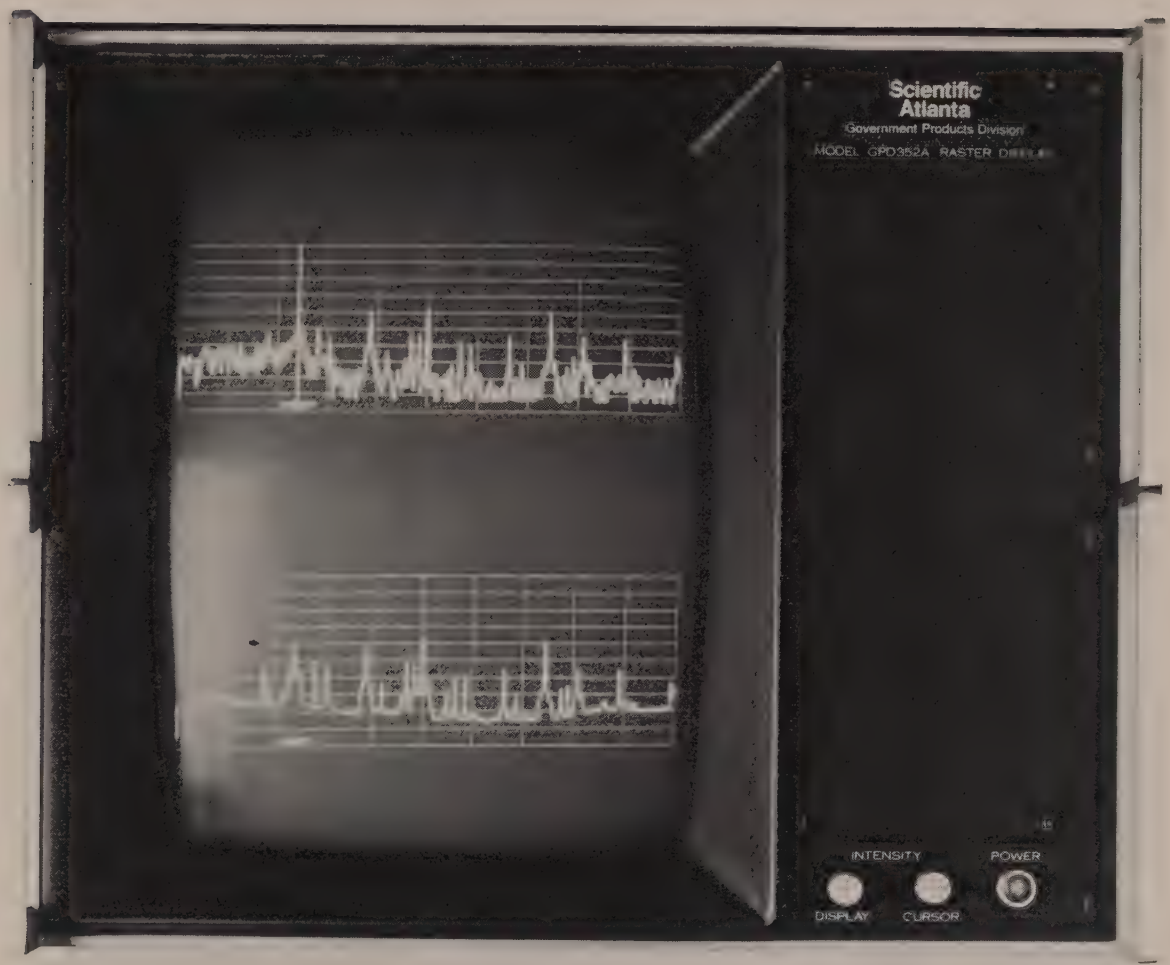

Figure 1.1. Model GPD352A Raster Display

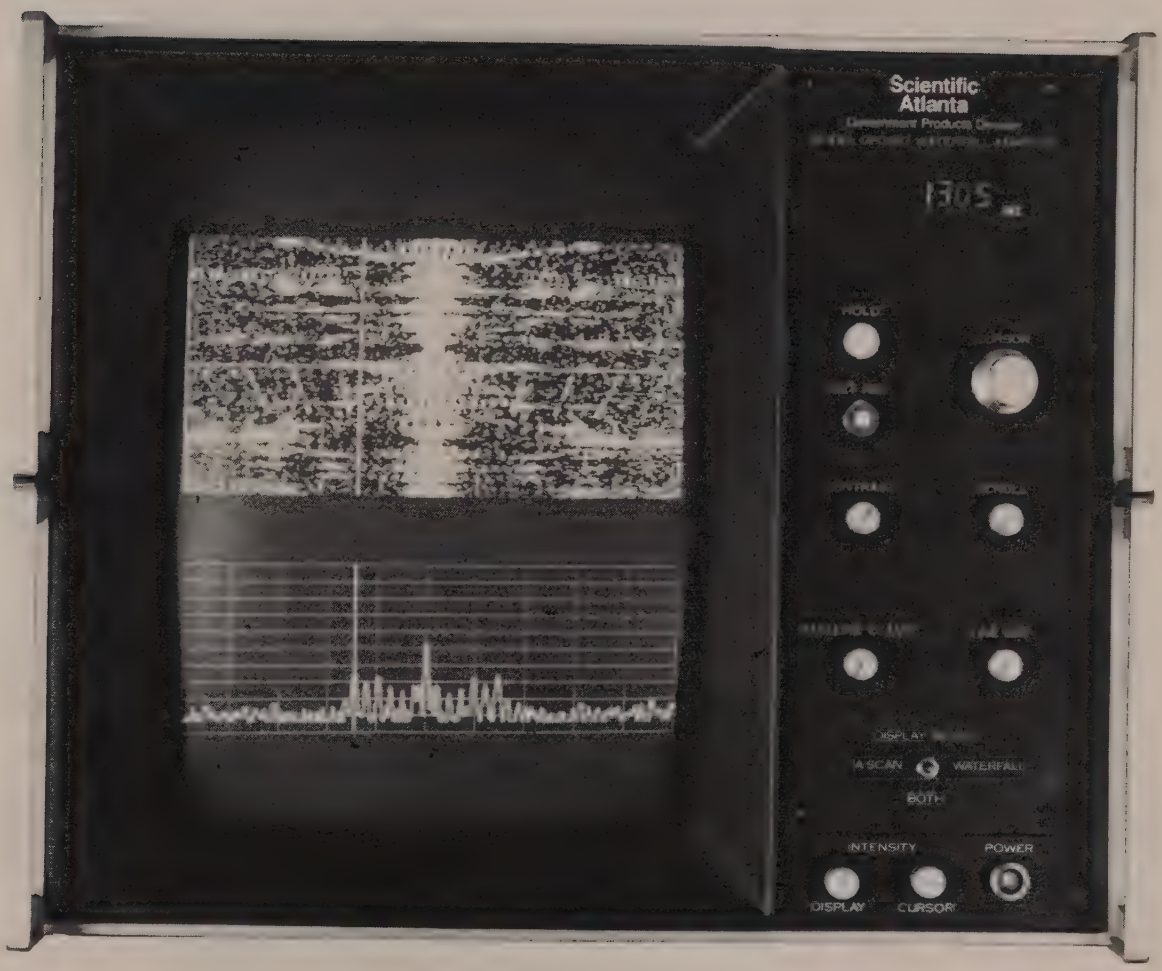

Figure 1.2. Model GPD353A Waterfall Adapter
(Shown Installed in a GPD352A)

SECTION I

GENERAL INFORMATION

1.1 Introduction

The GPD352A Raster Display is designed for use with the GPD350-6A High Speed Signal Analyzer and the GPD351A Digital Signal Translator. Its purpose is to provide a crisp, flicker-free display of frequency spectrum data produced by the GPD350-6A. Figure 1.1 is a front view of the GPD352A and Figure 1.3 is a simplified block diagram of the GPD352A.

The GPD353A Waterfall Adapter Kit is designed to be installed in a GPD352A to provide waterfall display capability and hardcopy output interface to the Honeywell LS-85 Fiberoptic Recorder. Figure 1.2 is a front view of the GPD353A installed in a GPD352A and Figure 1.4 is a simplified block diagram of the GPD353A.

Since the GPD353A adds waterfall display capability without altering the GPD352A's operation, this manual has sections to describe both the GPD352A and GPD353A. In instances where the information applies to the GPD352A with a GPD353A installed, the designation GPD352A/353A will be used.

The GPD352A and the GPD352A/353A are designed for mounting in a standard 19-inch rack and two 6-foot cable assemblies for interconnection with the GPD350-6A are provided.

1.2 Characteristics - GPD352A

The following features are provided by the GPD352A.

a. Vertical Format CRT.
b. 800 x 1000 pt. resolution.
c. 60 Hz non-interlaced raster.
d. Optically coated anti-glare screen.
e. Variable intensity data, cursor and grid lines.

1.3 Characteristics - GPD353A

The following features are provided by the GPD353A.

a. Installs within the GPD352A.
b. 160K data points stored.
c. Time cursor readout.
d. Delta time control, readout.
e. 8-bit data points stored for display or recall to GPD350-6A.
f. Interface to fiberoptic recorder of oldest data.

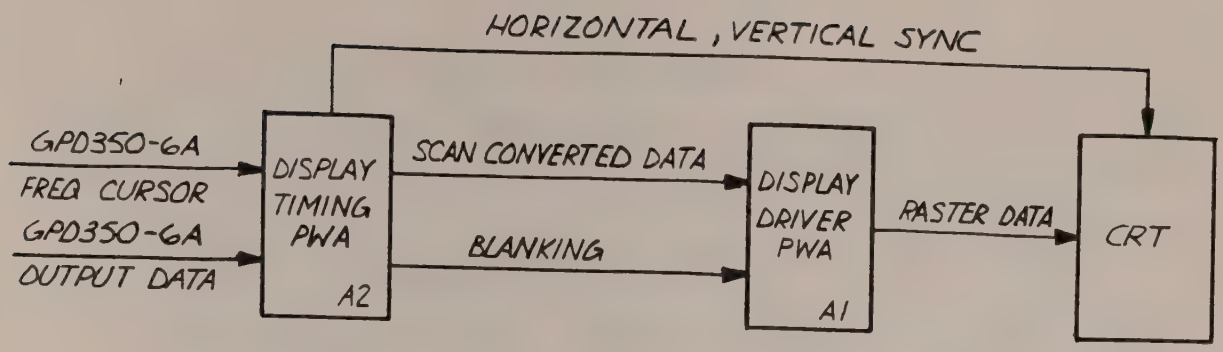

Figure 1.3. Block Diagram, Model GPD352A Raster Display

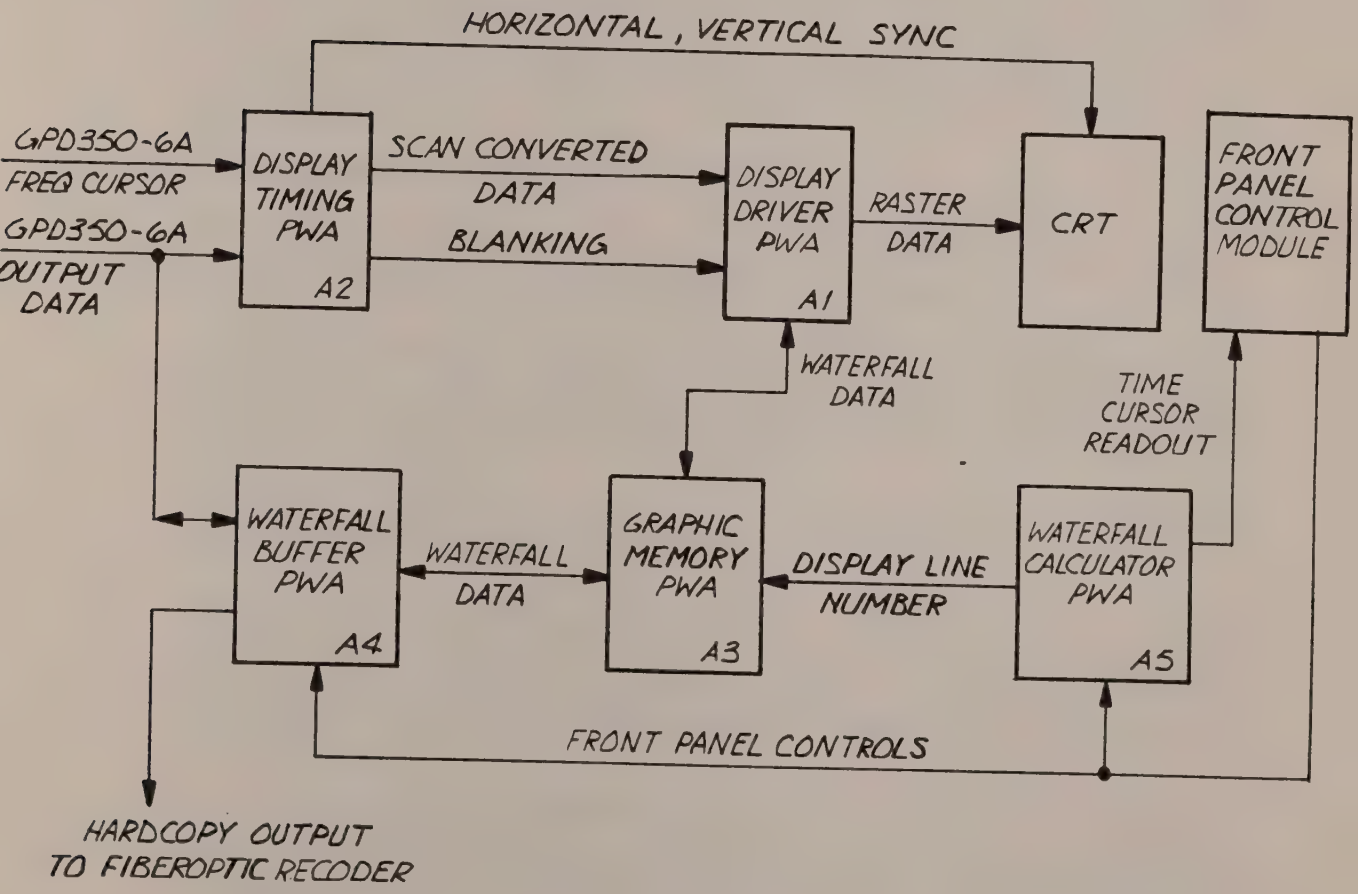

Figure 1.4. Block Diagram, Model GPD 353A Waterfall Adapter and GPD352A Raster Display

1.4 Front Panel Description - GPD352A

Figure 1.1 is a front view of the GPD352A Raster Display. The front panel controls and indicators provide the following operational functions.

POWER Pushbutton/Indicator - Applies primary power to the GPD352A. Illuminated when ON.

INTENSITY, DISPLAY - Varies the amount of beam current (brightness) of the CRT. The fully counterclockwise position is the minimum level, and the fully clockwise position is the maximum level.

INTENSITY, CURSOR - Varies the amount of brightness of the Frequency Cursor and the display grid lines. (Note that the Frequency Cursor position is controlled by the cursor knob on the GPD350-6A.) This control has four adjustment settings. Rotating from the fully counterclockwise position in the clockwise direction, they are: Frequency Cursor and grid lines completely blanked; Minimum intensity level Frequency Cursor; Medium intensity level Frequency Cursor and and grid lines; Maximum intensity level Frequency Cursor and grid lines.

1.5 Front Panel Description - GPD353A

Figure 1.2 is a front view of the GPD353A installed in a GPD352A. The controls and indicators of the Front Panel Control Module provide the following operational functions.

DISPLAY SELECT - Selects the Waterfall display, A-Scan display, or "BOTH" formats. When "A-Scan" is selected, the display will look like a GPD352A. However, the Waterfall Memory is still active and is subject to all the controls as explained below.

When "WATERFALL" is selected, the displayable contents of the Waterfall Memory are presented on the CRT.

When "BOTH" format is selected, the upper half of the display contains Waterfall data, the lower half contains A-Scan data, corresponding to either AUX or AVGR data, depending on the position of the Dual Display switch on the GPD350-6A. For further operational description, see section 2.4.3.1.

HOLD - A lighted pushbutton, when active (illuminated), inhibits the updating of Waterfall Memory with new data. "HOLD" will also inhibit the Fiberoptic Recorder (if attached) from writing new data lines. Also see section 2.4.3.1.

SET REF - This lighted pushbutton, when active (illuminated), sets the current location of the time cursor to zero, thereby providing a reference point to make delta time measurements from. When inactive, time is referenced from the top of the screen. In both settings the direction for position time is down the screen.

CURSOR - This knob moves the horizontal cursor line up and down. Clockwise rotation moves the cursor down the CRT. The intensity of the cursor line is controlled in the same manner as the Frequency Cursor, described above.

CURSOR LED READOUT - The LED readout always represents time (displayed as minutes or seconds, depending on input data ranges) based on the cursor's positioning in the Waterfall Display. However, the LED readout will display the actual data line number of the Waterfall Memory when the GPD350-6A AUX Memory controls are set to either a) or b), or both, as shown below (also ref. Figure 1.5):

a) SOURCE: EXTERNAL
b) TRANSFER: HOLD/EXT or LOAD (momentary)

This is because in any of these settings, the GPD353A no longer has any way of calculating the time relationship between the data lines stored in Waterfall Memory. This is because either the source of the data is external, or the loading of data is occurring under external/momentary control (or both).

SCROLL - A control that provides scrolling capability through the Waterfall Memory. It is only active when the number of lines stored in the Waterfall Memory is greater than the number of lines currently being displayed on the CRT. This is always the case when the LINE SEP control is set to the maximum, or the GPD350-6A is set to a transform size of "256" or less. The "top" (most recent data) of the Waterfall Memory is displayed when SCROLL is in the fully counterclockwise position. The "bottom" (oldest data) of the Waterfall Memory is displayed when SCROLL is in the fully clockwise position.

LINE SEP - Controls the separation between the lines of spectral data displayed on the CRT. The range of control is from a minimum separation of zero blank lines between each data line (fully counterclockwise position) to a maximum separation of 15 blank lines between each data line (fully clockwise position).

CONTRAST - Controls the variation in contrast of the displayed data. The contrast level is applied to the data right before it is sent to the CRT, so it does not change the contents of Waterfall Memory. Contrast is at minimum level when the knob is in the fully counterclockwise position.

BASELINE CLAMP - Controls the clipping level being applied to the displayed data. Data equal to, or less than the Baseline Clamp value is set to zero before being displayed. This is done right before the data is sent to the CRT, so the contents of Waterfall Memory remain unchanged. Baseline Clamp is at its minimum value (off) when the knob is in the fully counterclockwise position.

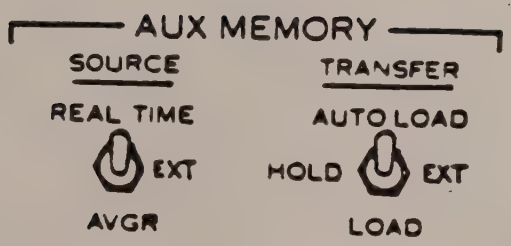

Figure 1.5. GPD350-6A AUX Memory Controls

1.6 Specifications

GPD352A

Viewing Area: Maximum 11 in. vertical
8-1/2 in. horizontal

Phosphor: Aluminized P31

Compatability: Operates with a GPD350-6A High Speed Signal Analyzer. The GPD351A Digital Signal Translator can also be added.

Power: 105-125/210-240 VAC (switch selectable); 50-60 Hz; approximately 175 watts.

Dimensions:

Height:	35.5 cm (14")
Width :	43.18 cm (17")
Depth:	47.6 cm (18-3/4")
Weight:	22.7 Kg (50 lb)

GPD353A Installed Within a GPD352A

Compatibility: Same as GPD 352A. Additonally, a Honeywell LS-85 can be connected for a hardcopy record of the Waterfall Display.

Memory Size: 160K Data Point Storage

Spectrum Storage:

Xform Size	Pts/Spectrum	Spectra Stored
2048	800	200
1024	400	400
512	200	800
256	100	1000
128	50	1000
64	25	1000

Power: Uses power suppled by GPD352A. Approximately 75 watts.

Dimensions: Installed within GPD352A envelope. Adds 2.5 Kg (5.5 lb) to GPD352A weight.

SECTION II

OPERATION

2.1 General

This section provides interconnection and operating procedures for the GPD352A and the GPD352A/353A Display. It is recommended that the operator become familiar with these procedures before operating the instrument. The operator must also be familiar in the applicable operating procedures of the GPD350-6A High Speed Signal Analyzer.

2.2 Interconnect

TheGPD352A and the GPD352A/353A Displays are designed to operate with the GPD350-6A High Speed Signal Analyzer, and with the GPD351A Translator.* Both the GPD352A and the GPD352A/353A accept data and control signals from the GPD350-6A, and generate the presentation viewable on the CRT. When a GPD351A is also used, one of the control cables is daisy-chained from the back panel of the GPD352A or the GPD352A/353A to the back panel of the GPD351A. Figure 2.1 shows these interconnections.

2.3 Operation - GPD352A A-Scan Display

2.3.1 Power Up

Before applying power to any of the instruments, ensure that the input power select switches "S1" and "S2" are set to the correct value, either 115V or 230V. These switches are located on the lower left corner of the GPD352A back panel. After appropriate switch settings and connections have been made (ref. Figure 2.1), apply primary power to the GPD352A (indicator will illuminate) and operate the GPD350-6A and the GPD351A (when connected) according to their operating procedures.

2.3.2 Operation Setup, GPD352A

a. Allow the GPD352A Display to warm up for 2 minutes.

b. Set the GPD350-6A for Dual Display, Real Time Data (Lower), Averager Data (Upper), and select the test position for the Input. Observe an upper and lower display block.

*Additionally, the GPD352A/353A is designed to interface with an LS-85 Fiberoptic Recorder to provide hardcopy output.

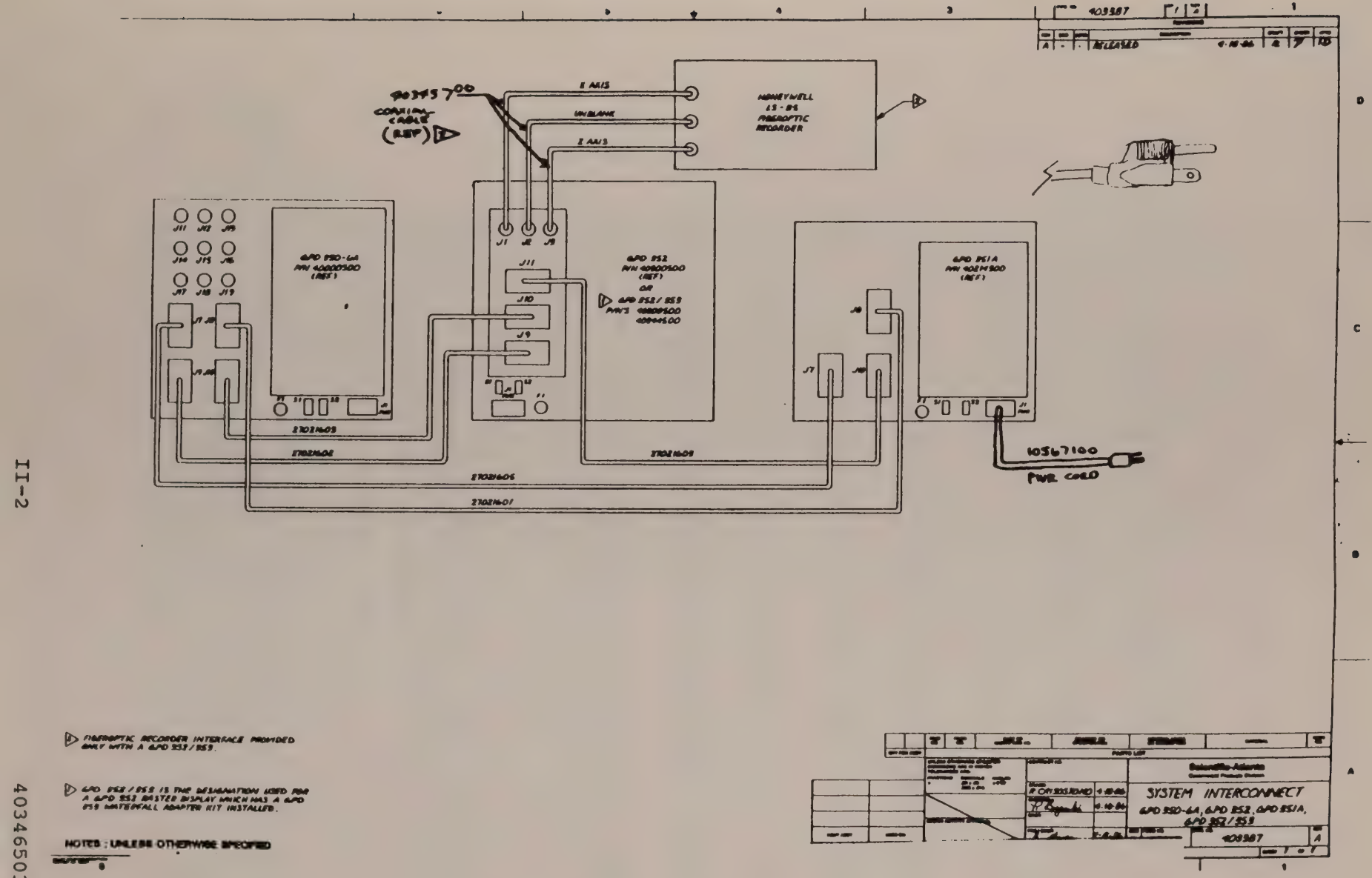

Figure 2.1. System Interconnect
GPD350-6A, GPD352A, GPD351A, GPD352A/353A

c. Adjust Display Intensity until data is observed at the desired brightness level.

d. Adjust the Cursor Intensity until the cursor and grid are displayed at the desired brightness level (there are four position settings available).

e. Reset the Averager of the GPD3506A and verify that the upper data trace on the GPD352A becomes flat, parallel to the horizontal grid lines.

f. Position the "Cursor Upper/Lower" switch at "Upper" on the GPD350-6A.

g. Turn the Frequency Cursor knob on the GPD350-6A clockwise, and observe the vertical frequency cursor indicator moving from left to right on the upper display block.

h. Verify that the amplitude value at various frequencies is -109.0 dB $\pm$ .3 dB.

i. Reposition the Cursor "Upper/Lower" switch on the GPD3506A to "Lower."

j. Move the Frequency Cursor knob to position the cursor on the tallest tonal displayed. The amplitude value should read 0.0 dB $\pm$ .3 dB.*

k. Move the Input Range knob on theGPD350-6A counter-clockwise 1 position, and observe the Real Time Data to drop in amplitude 1 horizontal grid level (10 dB). The amplitude value shown on the GPD350-6A LEDs should still read 0.0 dB $\pm$ .3 dB.

l. In the EXPAND section of the GPD350-6A, set the Magnify switch to X8, the % Range switch to 20%, and the toggle switch to Intensify. Observe that an intensified bar appears near the bottom of the A-Scan grid. Move its location around using the Magnify and % Range switches.

m. The GPD352A is operational upon successful completion of the above steps.

* Note that the cursor appears in the center of the frequency bins for "Transform Size" selections 64, 128, and 256 on the GPD350-6A With transorm size selections of 512 and 1024, the cursor is left-justified to the edge of the bin. In transform size 2048, the width of the cursor is the same as the width of each frequency bin. In each of the last 3 cases, a "flag" appears with the cursor at the amplitude level of the bin the cursor resides in.

2.4 Operation - GPD353A Waterfall Display

2.4.1 Power Up

After completing section 2.2, position the GPD353A front panel "Display Select" switch to "A Scan", and proceed through section 2.3 of the manual.

2.4.2 Operation Setup - GPD353A

a. After completing section 2.3, position the Display Select switch to "Waterfall".

b. Rotate the "Contrast", "Baseline Clamp", "Scroll", and "Line Sep" controls fully counterclockwise.

c. Ensure that the "Hold" and "Set Ref." pushbuttons are not illuminated, depress either if necessary.

d. Set the GPD350-6A AUX MEMORY CONTROLS to "Real Time" for the Source and "Auto Load" for the Transfer Mode.

e. Set the Range switch to "50 KHz" and the Transform Size switch to "2048" and observe a block of data in the upper 1/4 of the screen. The data will appear to be "falling", as the most current data is updated at the top of the screen, and existing lines of data move down the screen as the updates occur.

f. Rotate the Contrast control and observe variation in the contrast of the displayed data.

g. Rotate the Baseline Clamp control clockwise and observe the increasing clipping level being applied to the data.

h. Spin the Cursor knob clockwise and verify that the Horizontal Time cursor moves down the display. When it is positioned at the bottom of the data block the GPD353A Front Panel Time Readout should show 2.806 SEC.

i Now spin the Cursor knob counterclockwise to position the Cursor line somewhere in the middle of the data and note the corresponding time.

j. Depress the SET REF. pushbutton so that it illuminates. The Time Readout should now read 0.00 SEC. The Time Readout will display the delta time values when the cursor position is changed.

k. Depress the HOLD pushbutton so that it illuminates. The updating of the data should cease and the display remain stable.

l. If a time varying input signal is available, connect it to the GPD350-6A and adjust the gain to an acceptable level.

m. Depress HOLD again and observe the time varying signal's movement in the Waterfall Display. Briefly switch the DISPLAY SELECT to the "A-SCAN" setting for comparison, then switch back to "WATERFALL".

n. Depress HOLD.

o. Adjust LINE SEP to approximately 3/4 of its maximum value, and observe the "expansion" of the display.

p. Rotate the SCROLL to move through the memory.

q. The GPD353A is operational upon successful completion of the above steps.

2.4.3 Input/Output Operation From the GPD350-6A

Data is entered into the Waterfall Memory whenever the "AUX" memory is loaded in the GPD350-6A, whether by Real Time, Averager, or "EXT" (via the GPD351A GPIB interface section). Data entry is inhibited only when the GPD352A/353A or GPD350-6A is in "HOLD". (See Figure 1.5.)

The source of data can be:

a. "Real Time" which is the direct FFT output.

b. "EXT" which is an external source can either be the current Waterfall Memory or the GPD351A, which via the GPIB can provide external data.

c. "AVGR", the external averager, which then gives a selection of "LIN", "EXPO" (expotential), or "PEAK" averaging and an "N" or number of ensembles for each average.

Activating the Waterfall "HOLD" signal to preclude data entry and selecting an "EXT" source on the GPD350-6A sets the circuitry to accept a spectrum from the Waterfall back into the "AUX MEMORY". This transfer can be automatic with the "TRANSFER" switch set to "AUTO LOAD" or manual with activation of "LOAD". The GPD353A cursor controls the selection of the spectrum, identified by the intensified line on the Waterfall presentation, to be transferred back to the GPD350-6A AUX Memory.

2.4.3.1 Automatic Data Transfer Between GPD353A Waterfall Memory and GPD350-6A AUX Memory

The transfer of data from the Waterfall Memory back to the GPD350-6A is further enhanced when the GPD353A Display Select is set to "BOTH", and the Dual Dispaly Mode switch of the GPD350-6A is set to AVGR/AUX.

The display presentation on the GPD353A will consist of both the Waterfall Memory (upper half of display) and the A-Scan of the AUX Memory (lower half of the display).

When "HOLD" is inactive, the Waterfall and A-Scan displays will both reflect the AUX Memory controls of the GPD350-6A (i.e., Real Time data, AUTOLOAD). (Reference Figure 1.5)

When "HOLD" is activated, the Waterfall will stop updating, and the AUX Memory data in the A-Scan display will automatically be loaded from the line of Waterfall Memory corresponding to the Time Cursor's position. The LED Readout will still display time values.

In the past, this transfer would not occur unless the AUX Memory Source switch was set to EXTernal, and then the LED Readout could only display line number values.

Now, this function is transparent to the operator. However, the operator can still physically move the AUX Memory Source switch to EXTernal and see the line number values in the LED Readout display as before.

The rate of data load is also selctable, and depends upon the source:

TRANSFER	SOURCE	RATE
AUTO LOAD	REAL TIME	Every FFT processing cycle. (A function of Transform Size.)
	EXT	Special Case*
	AVGR	Averager is made to recycle after N ensembles (N memory periods). 2 The Averager does not reset in "EXPO'.
HOLD-EXT	REAL TIME	No-Loading.
	EXT	Special Case*
	AVGR	No-Loading
LOAD (MOMENTARY)	REAL TIME	Loads once on operation of switch.
	EXT	Special Case*
	AVGR	Loads once on operation of switch.

* The "Special Case" concerns selection of an "EXT" source. Normally, the source is from the GPIB adapter section of the GPD351A for which both switches must be set to "EXT" to enable the GPD351A to synchronize the data transfer.

SECTION III

CONCEPT OF OPERATION

3.1 General

The GPD352A and GPD353A are instruments which interface with the GPD350-6A output data bus, and generate a display which is presented on the CRT. The GPD352A produces the familiar "A-Scan" or Amplitude vs Frequency Spectral display of either real time or averaged data.

The GPD353A provides a waterfall (time history) presentation of the real time or averaged spectral data in vertical format. The most recent data line is shown at the top of CRT, while the oldest data line appears at the bottom of the CRT. Hence, as the display is updated with new data, the existing data lines are shifted down the screen as the new data line is presented at the top of the screen. As this updating process continues, the data appears to be "falling" down the screen, hence the name waterfall display.

3.2 GPD352A A-Scan Display

(Refer to Figure 1.3)

The GPD352A consists of two PC cards and a raster scan CRT installed in a 19" rack-mountable chassis. The Display Timing card, located in Card Cage Slot A2, interfaces with the GPD350-6A output bus and does the mapping of the output data to raster display format (scan converted data). It also generates the display Sync and timing signals needed to drive the raster scan CRT and produces the frequency cursor line.

The Display Driver card, located in Card Cage Slot A1, takes the scan converted data and blanking information, does some signal conditioning, and puts them through a Video DAC. The output of the Video DAC drives the Video Amplifier section of the Raster Scan CRT directly via a COAX cable. The data rate is 65 MHz.

The two PC cards are mounted in a five-card modular cage which is wired to accept the three additional cards which are part of the GPD353A Waterfall Adapter kit.

3.3 GPD353A Waterfall Display

The GPD353A consists of three PC cards and a front panel control module with a cable to connect the module to the GPD352A cardcage. As described in Section 1.1, the GPD353A Waterfall Adapter Kit installs in a GPD352A. As seen from Figure 1.4, the GPD350-6A output data bus is routed to the Waterfall Buffer. This card provides bi-directional data interface between the GPD350-6A output bus and Graphic Memory. It also provides the output of the oldest Waterfall line to the LS-85 Fiberoptic Recorder.

Once the Graphic Memory has read in a new line of spectral data, it writes the oldest line of spectral data back to the Waterfall Buffer card to be output to the Fiberoptic Recorder. These operations are able to take place simultaneously with the constant CRT refreshing due to the use of a Video Controller Chip in conjunction with a microprocessor. Under the special constraints explained in Section II, any line of waterfall data (selected by the GPD353A cursor) can be sent back to the GPD350-6A AUX Memory. In this instance, the Waterfall Calculator supplies the line number to be output to the Graphic Memory.

The Waterfall Calculator card, located in Card Cage Slot A5, keeps track ofthe GPD353A's cursor position and controls the Cursor LED Readout accordingly.

The Front Panel Control Module supplies the display control information to the system and displays GPD353A cursor time/line information on its LEDs.

SECTION IV

CALIBRATION AND MAINTENANCE

4.1 Introduction

This section contains calibration, troubleshooting, and parts replacement information. Before performing the procedures in this section, become familiar with the Front Panel Controls (Section II), and Concept of Operation (Section III).

4.2 Calibration Procedures

The GPD352A and the GPD353A have been precalibrated at the factory and should not normally require calibration in the field. Most of the circuitry is digital and, therefore, calibration is not applicable. Calibration of the CRT is not recommended due to high voltage shock hazard. However, the master adjustment for the overall display brightness is accessible and is described on page 3 and figure 2.A of the U.S. Pixel Manual in Appendix B.

The other item which can be calibrated is the main power supply for the card cage in the GPD352A and the GPD352A/353A. The dc supply voltages on the card cage backplane are measured under full load with the bottom slide cover removed. Proceed with adjustment only if the measured voltages exceed the following limits:

+ 5V measured from 4.90 Vdc to 5.10 Vdc
+15V measured from 14.80 Vdc to 15.20 Vdc
-15V measured from 15.20 Vdc to 14.80 Vdc

+ 5 Vdc is adjusted using pot R44 of the power supply
$\pm$15 Vdc is adjusted using pot R22 of the power supply

4.3 Troubleshooting

To effectively troubleshoot the GPD352A or the GPD352A/353A, one must be familiar with the Concept of Operation and the block diagrams presented in earlier sections of this manual. The instructions given here should allow isolation of malfunctions to the printed circuit card level. Isolation of problems to the component level is not supported. Schematic and interconnect wiring information is supplied in Appendix A. These will aid in understanding the card operations and the tracking of signals withinthe GPD352A chassis. The GPD352A or the GPD352A/353A is assumed to be set up with a GPD350-6A for troubleshooting.

4.3.1 GPD352A Troubleshooting

4.4 Replaceable Parts and Assemblies

All repair parts for the GPD352A and GPD353A may be ordered directly from the Grovernment Products Division of Scientific-Atlanta. A list of these is given in Table 4-1.

Table 4-1. GPD352A and GPD353A Recplaceable Parts and Assemblies

	Part Name	Card Cage Slot	Part Number
GPD352A	Display Driver	A1	40352000
	Display Timing	A2	40351000
GPD353A	Graphic Memory	A3	40103001
	Waterfall Buffer	A4	40312000
	Waterfall Calculator	A5	40353000
	Front Panel Control Module	--	40355000

LIST OF DRAWINGS
MODEL GPD352A RASTER DISPLAY
GPD353A WATERFALL ADAPTOR

REF DES	NAME	ASSY NO.	SCHEMATIC NO.
A1	DISPLAY DRIVER	40352000	403521
A2	DISPLAY TIMING	40351000	403511
PS1	POWER SUPPLY	42903800	
---	INTERCONNECT RASTER DISPLAY	---	403027
---	INTERCONNECT CARD CAGE, ASSY	---	403507
---	U.S. PIXEL TECHNICAL MANUAL	HI RESOLUTION MONITOR	

(SUPPLIED WITH EACH MONITOR 403308)

THE FOLLOWING DRAWINGS ARE UTILIZED WITH THE GPD352A/353A CONFIGURATION ONLY (WATERFALL ADAPTER).

A3	W/F GRAPHIC MEMORY	40103001	401031
A4	W/F BUFFER	40312000	403121
A5	W/F CALCULATOR	40353000	403531
---	W/F DISPLAY MODULE	40355000	403551

MP MASTER
MA29852